Comparison of milk consumption and its contribution to total sugar intake in South African and other schoolchildren

B. D. RICHARDSON, R. E. SINWEL, P. E. CLEATON-JONES

Summary

Mean daily milk, lactose and energy intakes were measured in groups of South African school pupils of 9 - 16 years. Recommended dietary allowances (RDA) were not reached by any of the groups.

In comparison, groups of Canadian, Nigerian and German schoolchildren of similar ages fell into two categories, namely high milk consumers and low milk consumers. Lactose and energy intakes for high consumers were 77% of the RDA, compared with 30 - 40% for low consumers. The lactose contribution to daily energy intake for Canadian children was 10,7% and for South African groups about 5%. Thus for South African children lactose contribution to total sugar intake may be half that of Canadian children. Exact proportions need to be defined.

S Afr Med J 1987; **71**: 495 - 498.

At the symposium on sugar and health held in Durban on 6 - 7 May 1985, attention was drawn to the sugar intake of Canadian and South African preschool children.[1,2] Although total sucrose intake by children in the two countries was similar, sucrose contributed some 54% and lactose about 19% of Canadian children's total sugar intake. There is a lack of data on lactose intake and its contribution to total sugar intake by South African children.

For this reason milk intakes of South African groups were assessed from data collected about schoolchildren aged 9 - 16 years in four ethnic groups. These intakes, together with derived values for lactose, are discussed, as is the role of milk as a provider of energy.

Subjects and methods

Black (rural and urban), coloured, Indian and white urban schoolchildren aged 9, 12, 14 - 15 and 16 - 17 years were asked to complete a 24-hour dietary questionnaire under the supervision of a trained dietitian. Black children in the rural area attended schools in the Gelukspan district of Bophuthatswana; black, coloured, Indian and white urban groups attended schools in and around greater Johannesburg. The schools were chosen as representative by their respective local authorities. Pupils from all ethnic groups were almost equally represented in both age and sex groups, and comprised all children of the relevant age groups present in school classes on the day of interview.

Milk intake was calculated from information given on the questionnaires, and included milk taken in non-processed form such as in milk drinks, in tea and with porridge or cereal. Milk products such as cheese and yoghurt were not included. Lactose intake was calculated by estimating 4,7 g lactose/100 ml milk.[3] Energy intake calculation was based on the recommended dietary allowance (RDA) caloric range for children 6 - 17 years old of 2 400 - 2 800 kcal (10 080 - 11 660 kJ) per day.[3] Milk and milk products provide almost a quarter of total calories,[3] therefore by calculation 600 - 700 kcal should come from this source and since milk forms about 50 - 60% of total milk and milk product intake,[4] milk alone should provide some 358 kcal daily. The RDA values used for this study were 26 g lactose and 358 kcal providing 13,8% of energy. As 100 ml milk provides 65 kcal[5] to meet the child's RDA of 358 kcal from milk, 550 ml needs to be consumed daily.

The data about how much milk was consumed, were entered into a computer and manipulated using SAS (version 5 edition).[6] The non-parametric Kruskal-Wallis one-way analysis of variance by ranks[7] was used. The critical level of statistical significance chosen was $P < 0,05$.

Results

Table I shows numbers of subjects in each ethnic group by age and sex. Table II shows means and standard deviations, median values, and the range of daily intakes by ethnic group and age.

Only 4 out of the 20 groups tested showed a statistically significant difference for milk consumption between the sexes. Details of these 4 groups are as follows: for black rural 9-year-olds, the median daily milk intake for boys (125 ml) was significantly less than for girls (180 ml) ($P < 0,001$); for white 14-year-olds the intake was boys 200 ml, girls 112,5 ml ($P < 0,01$); black urban boys drank 180 ml and girls 50 ml ($P < 0,001$); and white 16-year-old boys drank 232,5 ml and girls 75 ml ($P < 0,001$). The median daily milk intake of boys was significantly greater than that of girls.

Because so few groups showed significant differences, it was decided to pool the data for the sexes. Significant differences between the ethnic groups was present only in 9- and 14-year-old children. In the 9-year-old group coloured children had significantly lower mean milk intakes than black rural children ($P < 0,001$), and Indian or white children (both $P < 0,001$). The two black groups showed no significant difference in mean milk intake but both had significantly lower intakes than Indian and white groups ($P < 0,01$). Coloured 14-year-olds had significantly lower mean milk intakes than all the other groups ($P < 0,01$) except Indian children. No other significant differences were present.

Table III shows mean daily milk consumption of the four South African ethnic groups compared with intakes for 116 Canadian children of 11 - 12 and 14 - 15 years,[4] 540 German children of 11 - 13 years,[8] and 246 Nigerian primary schoolchildren (ages not stated) living in Anambra state.[9] The similarity of numbers studied and ages thus makes comparison relevant. All children had daily milk intakes below that of the RDA, low milk consumers taking 30 - 40% of RDA and high consumers 77% of RDA.

In Table IV calculated daily values for mean milk calories and mean lactose intakes are shown, as well as mean milk calories

Epidemiology Section, National Research Institute for Nutritional Diseases of the South African Medical Research Council, Johannesburg
B. D. RICHARDSON, D.SC.
R. E. SINWEL, DIP.HOME ECON.
MRC Dental Research Institute, School of Dentistry, University of the Witwatersrand, Johannesburg
P. E. CLEATON-JONES, B.D.S., M.B. B.CH., PH.D., D.P.H.

TABLE I. NUMBERS IN FOUR SOUTH AFRICAN ETHNIC GROUPS OF SCHOOL PUPILS ACCORDING TO AGE AND SEX

	Sex	Age (yrs) 9	12	14 - 15	16 - 17	Total
Black rural	F	39	29	60	55	193
	M	40	39	40	52	171
Black urban	F	40	40	40	41	161
	M	40	39	41	40	160
Coloured urban	F	40	40	40	46	166
	M	37	40	38	41	156
Indian urban	F	43	40	40	43	166
	M	38	40	39	48	165
White urban	F	35	30	36	41	142
	M	29	42	35	38	144

expressed as a percentage of daily total energy intake for South African, Canadian, German and Nigerian schoolchildren compared with the RDA. Milk calories and percentage energy derived from daily milk intake in both low and high consumers were below RDA requirements, low consumers having 100 - 148 milk calories daily providing only 4,5% to 5,7% of energy and high consumers having 277 - 279 milk calories daily providing 10,7% of energy, whereas RDA values require 350 milk calories daily providing 13,8% of energy.

Discussion

Over the years the use of RDAs has raised much controversy.[10,11] In this discussion RDA values are therefore used as a yardstick to enable comparisons to be made between the various ethnic and international groups, and are not necessarily regarded as the ideal to be reached. Many children are in good health even if they do not reach these recommended allowances.[12] According to Harper[13] recommended amounts are average amounts and therefore *must* exceed average nutrient requirements, except for energy allowances. Hegsted[14] makes it clear that 'the nutrient needs of young children may be adequately met by 50% of the US RDA'. Walker and Walker,[15] discussing the RDA in Third-World populations, point out that little is known of what, if any, health hazards are associated with intakes of many nutrients which fall far short of RDA values. For instance the great majority of Third-World mothers lactate successfully for long periods with no detriment to health, although their food intakes fall far short of recommended allowances. Thus the calculated RDA of 550 ml milk daily is obviously unrealistically high, as it is far higher than that reported for any of the groups (Table III). Even Canadian schoolchildren of 11 - 12 and 14 - 15 years, who consume extremely high amounts of milk, take only 77% of the recommended amount as do those Nigerian primary schoolchildren who receive additional milk at school, pushing their intake up from 34% to 77% of RDA. Black South African schoolchildren, whose milk intake has been shown to be low,[16] consume amounts similar to those of Nigerian primary schoolchildren of similar ages with no milk supplement at school (33% and 34% of RDA respectively). German children of 11 - 13 years consume 40% of RDA, as do white South African schoolchildren aged 9 - 16 years. Coloured and Indian South African schoolchildren also have a very low milk intake, 28% and 37% of RDA respectively.

The quantities of milk consumed daily by various groups of schoolchildren show two patterns. Firstly there are the high milk drinkers, Canadian and Nigerian children (supplemented with school milk) whose milk intake provides 10,7% of total energy, and secondly there are low milk drinkers, all South

TABLE II. MEANS AND STANDARD DEVIATIONS FOR DAILY MILK INTAKES, PLUS MEDIAN VALUES AND RANGES OF INTAKE IN SOUTH AFRICAN SCHOOLCHILDREN BY AGE

		Daily milk intake (ml) 9 yrs	12 yrs	14/15 yrs	16/17 yrs	Total No. of children
Black rural	No. of children	79	78	100	107	364
	Mean	168,3	247,3	183,8	195,3	197,4
	SD	118,59	201,56	190,24	224,51	192,35
	Median	150	175	125	125	150
	Range	0 - 540	0 - 900	0 - 900	0 - 1105	0 - 1105
Black urban	No. of children	80	79	81	81	321
	Mean	162,7	173,0	186,3	146,7	167,2
	SD	160,19	171,99	180,36	149,38	165,73
	Median	138	125	125	110	125
	Range	0 - 730	0 - 745	0 - 845	0 - 745	0 - 845
Coloured urban	No. of children	77	80	78	87	322
	Mean	121,9	212,1	130,3	157,2	155,9
	SD	142,60	208,74	137,73	162,6	168,51
	Median	85	168	75	110	110
	Range	0 - 665	0 - 1025	0 - 590	0 - 845	0 - 1025
Indian urban	No. of children	81	80	79	19	331
	Mean	266,9	225,2	150,4	175,7	203,9
	SD	204,84	189,78	133,44	173,52	182,21
	Median	230	180	125	125	175
	Range	0 - 935	0 - 870	0 - 600	0 - 845	0 - 935
White urban	No. of children	64	72	71	79	286
	Mean	250,8	248,9	212,4	201,7	227,2
	SD	179,89	203,48	187,3	211,16	196,90
	Median	250	200	175	150	175
	Range	0 - 745	0 - 900	0 - 895	0 - 1125	0 - 1125

TABLE III. MEAN DAILY MILK CONSUMPTION OF SCHOOL PUPILS IN VARIOUS COUNTRIES (RDA = 550 ml)

	Daily milk intake (ml)			
	Black*	Coloured	Indian	White
RSA	**182**	**156**	**204**	**227**
	(685)	**(322)**	**(331)**	**(286)**
Canada[4]				**429**
				(116)
Germany[8]				**220**
				(540)
Nigeria[9]				
No school milk	**185**			
With school milk	**426**			
	(246)			

*Includes both rural and urban pupils.
No. of subjects in parentheses.

TABLE IV. CALCULATED VALUES FOR MEAN LACTOSE INTAKE AND MILK CALORIES AS WELL AS MILK CALORIES EXPRESSED AS A PERCENTAGE OF TOTAL ENERGY, BASED ON RDA REQUIREMENTS FOR SCHOOL PUPILS

Country	Black*	Coloured	Indian	White
RSA				
Lactose (g)	**8,5**	**7**	**10**	**11**
Milk (kcal)	**118**	**100**	**133**	**148**
% energy	**4,5**	**3,8**	**5,1**	**5,7**
Canada[4]				
Lactose (g)				**20**
Milk (kcal)				**279**
% energy				**10,7**
Germany[8]				
Lactose (g)				**10**
Milk (kcal)				**143**
% energy				**5,5**
Nigeria[9]				
No school milk				
Lactose (g)	**9**			
Milk (kcal)	**120**			
% energy	**4,6**			
With school milk				
Lactose (g)	**20**			
Milk (kcal)	**277**			
% energy	**10,7**			
RDA[3]				
Lactose (g)				**26**
Milk (kcal)				**358**
% energy				**13,8**

*Includes both rural and urban pupils.

African, German, and non-supplemented Nigerian schoolchildren whose intake provides only 3,8 - 5,7% (Table IV).

The recommended daily intake of milk of 550 ml would contain 26 g lactose. Once again, the same pattern was seen in the various groups, with high and low lactose groups (Table IV). South African children have low lactose intakes from milk, ranging from 7 g to 11 g a day. Canadian white schoolchildren taking in 20 g of lactose have almost double the intake of white South African and German schoolchildren.

Canadian and white South African 5-year-old children were found to have similar total daily sucrose intakes: 77 g[1] and 90 g[2] respectively. However, the total sugar intake of Canadian children was 142 g per day; 65 g consisted of lactose, fructose, glucose and maltose, with lactose responsible for some 50% of these sugars.[2] The high total sugar intake of young Canadian children was thus in large part due to the inclusion of these other sugars which have not been calculated for South African preschool children. For completeness, future studies should include these other sugar sources, particularly lactose and fructose, thus enabling more direct comparisons of total sugar intakes to be made. This will be possible in collaborative studies with Hargreaves *et al.*,[17] who have the largest dietary database available which includes all the sugars. Lactose and fructose intakes could be responsible for a large part of the missing data of South African total sugar intake.

Whether all fermentable carbohydrates including lactose and fructose play a role in dental caries in man remains to be seen. To date epidemiological studies have not indicated this,[18]

although laboratory evidence exists of an effect of lactose, although less than that of sucrose, on caries promotion in rats[19] and hamsters.[20] Even the role of sucrose in the causation of dental caries is highly controversial with those in favour[21] and those far more sceptical.[22,23] Naylor[24] points out that it is not the absolute amount of sugar taken that is important in caries causation but rather the pattern of eating. Thus if total sugar intake is not responsible for caries, why are we concerned about the lactose contribution to total sugar? The answer is that milk also provides energy and in a developing community any food item providing extra energy is of value to the growing child; that this extra energy source will not promote caries is an added bonus. As a provider of energy, increased milk consumption could benefit low consumers, but this may well need to be set against the known high prevalence of lactase deficiency among black communities.[25] Segal *et al.*[25] suggested that the provision of fermented milk products would be more acceptable than whole milk in lactase-deficient black groups. Fermented milk is used traditionally in South Africa as 'maas' and is also culturally accepted.

REFERENCES

1. Hargreaves JA, Cleaton-Jones P, Richardson BD. Sugar consumption and dental caries: comparison between Canada and South Africa: I. Canadian studies. *Proceedings of the Second Symposium on Sugar and Health.* Durban, 6 - 7 May 1985. Durban: SA Sugar Association, 1985: 11-14.
2. Cleaton-Jones P, Hargreaves JA, Richardson BD. Sugar consumption and dental caries: comparison between Canada and South Africa: II. South African studies on 5-year-old children. *Proceedings of the Second Symposium on Sugar and Health.* Durban, 6 - 7 May 1985. Durban: SA Sugar Association, 1985: 15-19.
3. Dwyer J. Diets for children and adolescents that meet the dietary goals. *Am J Dis Child* 1980; **134:** 1073-1080.
4. Chao ESM, Anderson GH, Thompson GW, Hargreaves JA, Peterson RD. A longitudinal study of the dietary changes of a sample of Ontario children: II. Food intake. *J Can Diet Assoc* 1984; **45:** 112-118.
5. Konrad D, ed. *Documenta Geigy Scientific Tables.* 6th ed. Basle: JR Geigy, 1962: 514.
6. *SAS User's Guide: Basics, Version 5 Edition.* Cary, NC: SAS Institute, 1985: 1290.
7. Siegal S. *Nonparametric Statistics for Behavioral Sciences.* Tokyo: McGraw-Hill Kogakuska, 1956: 184-194.
8. Siebert A, Johnsen D. Breakfast of schoolchildren 11 to 13 years old. *Ernährungsforschung* 1984; **29:** 103-105.
9. Nnanyelugo DO. Evaluation of milk and nutrient intakes of school children in Nigeria. *Appetite* 1984; **5:** 175-185.
10. Harper AE. Dietary goals — a skeptical view. *Am J Clin Nutr* 1978; **31:** 310-321.
11. Hegsted DM. Dietary goals — a progressive view. *Am J Clin Nutr* 1978; **31:** 1504-1509.
12. Ferro-Luzzi A, Norgan MD, Durnin JVGA. Food intake, its relationship to body weight and age, and its apparent nutritional adequacy in New Guinean children. *Am J Clin Nutr* 1975; **28:** 1443-1453.
13. Harper AE. Recommended dietary allowances (revised - 1973). *Nutr Rev* 1973; **31:** 393-396.
14. Hegsted DM. Dietary standards. *N Engl J Med* 1975; **292:** 915-917.
15. Walker ARP, Walker BF. Recommended dietary allowances and Third World populations. *Am J Clin Nutr* 1981; **34:** 2319-2321.
16. Richardson BD. Milk-drinking habits of black South African schoolchildren. *S Afr Med J* 1982; **62:** 972-973.
17. Hargreaves JA, Thompson CW, Anderson GH, Peterson RD, Cleaton-Jones P. Dental caries and sucrose consumption: comparison between Canada and South Africa: I. Canadian studies of 5 - 6 year-old children. *Pediatric Dent* 1987 (in press).
18. Newbrun E. *Cariology.* Baltimore: Williams & Wilkins, 1978: 76-96.
19. Shaw JH, Krumins F, Gibbons RJ. Comparison of sucrose, lactose, maltose and glucose in causation of experimental oral disease. *Arch Oral Biol* 1967; **12:** 755-768.
20. Mäkinen KK. The role of sucrose and other sugars in the development of dental caries: a review. *Int Dent J* 1972; **22:** 363-386.
21. Shaw JH. Diet and dental health. *Am J Clin Nutr* 1985; **41:** 117-131.
22. Jackson D. The 'sweet tooth' and caries experience. *The Probe* 1979; July: 4-8.
23. Walker ARP. How practical are meaningful reductions in dental caries by dietary means? *Nutr Abst Rev* 1984; **54:** 211-217.
24. Naylor MN. Nutrition and dental decay. *Proc Nutr Soc* 1984; **42:** 257-263.
25. Segal I, Gagjee PP, Essop AR. Lactase deficiency in the South African black population. *Am J Clin Nutr* 1983; **38:** 901-905.

Postpartum sterilisation with the Filshie titanium silicone-rubber clip and subsequent pregnancy

V. P. DE VILLIERS

Summary

Pregnancy subsequent to postpartum Filshie clip sterilisation has occurred in 8 out of 789 patients operated on at Paarl Hospital since early 1983. As most pregnancies after sterilisation occur within 2 years, more failures can be expected. The use of this method has thus been discontinued.

S Afr Med J 1987; **71:** 498 - 499.

Department of Obstetrics and Gynaecology, University of Stellenbosch and Paarl Hospital, Paarl, CP
V. P. DE VILLIERS, F.R.C.O.G.

A preliminary report[1] on 101 postpartum Filshie clip sterilisations carried out at Paarl Hospital in early 1983 revealed many advantages of the method: speed of operation (average of 6,67 minutes per procedure), minimum damage to surrounding structures, and only 4 mm of the tube destroyed by pressure necrosis. Reversal by re-anastomosis was potentially easy. As young women in Paarl are increasingly requesting sterilisation after their second child, successful re-anastomosis is an important consideration. Despite the considerable extra cost, most Paarl patients have had a Filshie clip sterilisation in order to evaluate the method fully. No pregnancies were encountered within the first 27 months of the project. However, an alarming report by the Indian Council of Medical Research in October 1984 revealed 60 involuntary pregnancies in 869 women,[2] an early failure rate of 6,9% mostly in women sterilised either postpartum or after abortion.

The Mark VI Filshie clip is made of titanium with a silicone-rubber lining; it is 4 mm wide and 12,7 mm long, and